06-09-00

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:	Patrick K. Egan et al.	:	Date: June 8, 2000
Group Art Unit:	2831	:	IBM Corporation
Examiner:	K. Cuneo	:	Intellectual Property Law
Serial No.:	Unassigned	:	Dept. 917, Bldg. 006-1
Filed:	Unassigned	:	3605 Highway 52 North
Title:	BACKPLANE POWER DISTRIBUTION SYSTEM	:	Rochester, Minnesota 55901

Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

FILING UNDER 37 CFR 1.53

This is a request for filing a patent application which is an

__X__ Continuation-In-Part of prior application serial no. 09/074,213 filed on May 7, 1998, which is a divisional of prior application serial no. 08/615,154 filed on March 12, 1996, now U.S. Patent 5,841,074.

__X__ Incorporation by reference: The entire disclosures of the prior applications are considered as being part of the disclosure of the accompanying application and are hereby incorporated by reference therein.

EXPRESS MAIL CERTIFICATE

Express Mail Label No.: EK595507730US
Date: June 8, 2000

I hereby certify that I am depositing the enclosed or attached paper with the U.S. Postal Service "Express Mail Post Office to Addressee" service on the above date, addressed to the Assistant Commissioner for Patents, Box Patent Application, Washington, D.C. 20231.

James R Nock

James R. Nock

DOCKET NO. RO995-122B

Enclosed are:

- [X] 13 Pages of Specification and 1 Abstract
- [X] 4 Pages of Claims
- [X] 4 Sheets of Drawings
- [X] A Declaration and Power of Attorney (signed original needed for new or CIP applications or Divisional with added inventor(s))
- [ ] An Information Disclosure Statement and form PTO-1449
- [ ] A certified copy of _____
- [X] An assignment of the invention to International Busines Machines Corporation, Armonk, New York 10504

The filing fee has been calculated as follows:

Other Than Small Entity

For:	No. Filed	No. Extra	Rate	Fee
Basic Fee				$ 690.00
Total Claims	14 -20 =	0	x $18.00=	0.00
Indep. Claims	4 -3 =	1	x $78.00=	$ 78.00
[ ] Multiple Dependent Claim Presented			$260.00	$ 0.00
			TOTAL	768.00

Deposit Account Authorization:

- [X] Please charge Deposit Account No. 09-0465 in the amount of $768.00. A duplicate copy of this sheet is enclosed.
- [X] The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account 09-0465. A duplicate copy of this sheet is enclosed.
  - [X] Any additional filing fees required under 37 C.F.R. §1.16.
  - [X] Any patent application processing fees under 37 C.F.R. §1.17.

1. Amendments

__X__ A preliminary amendment is enclosed. (Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered **original** claim in the prior application.)

2. Priority - 35 U.S.C. 119

__X__ Priority of application serial no. 09/074,213 filed on May 7, 1998 is claimed under 35 U.S.C. 119.

3. Relate Back - 35 U.S.C. 120

A copy of the specification and Declaration/Power of Attorney for the prior application is filed herein.

I hereby declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

James R. Nock
Type or print name of person signing

Date: June 8, 2000

James R Nock
Signature

3605 Highway 52 North - Dept 917
Rochester, Minnesota 55901-7829

___ Inventor
___ Assignee of complete interest
___ Person authorized to sign on behalf of assignee
_X_ Attorney or agent of record
___ Filed under Rule 34(a)

Tel. No.:(507) 253-4661
Reg. No. 42,937

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Group Art Unit:	2831	:	IBM Corporation
Examiner:	K. Cuneo	:	Intellectual Property Law
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Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

EXPRESS MAIL Mailing Number EK595507730 US
Date of Deposit: June 8, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office To Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D. C. 20231

James R Nock
(Signature)

James R. Nock
(Attorney Name)

PROPOSED AMENDMENT TO THE DRAWING

Subject to the approval of the Examiner, please enter the amendments to the figures: No new matter has been added over the specification, claims and drawings originally provided.

IN THE DRAWINGS:

Figure 1

Please extend the pointers from reference numbers 18b and 18h as indicated.

Please delete the circles and extensions from layer 14hi as indicated.

Figure 2

Please insert a rectangular block with a lead line to a reference numeral 28, as shown.

Figure 3

Please insert a rectangular block with a lead line to a reference numeral 28, as shown.

Figure 4

Please insert and extend the edges of the powerplane 40 so the lower right-hand portion of the figure is not cut off.

Please delete the black shading from the impedance variations 42 at the left third of the page and at the far load locations 22 towards the top of the page, without disclaimer or prejudice.

Please insert lead lines from the reference numeral 20 to the holes on powerplane as indicated.

Please insert lead lines from the reference numeral 22 to the holes on powerplane as indicated.

Please insert lead lines from the reference numeral 30 to the holes on powerplane as indicated.

REMARKS

With respect to Figure 1:

the pointer from reference numbers 18b and 18h now reach their destinations;

the extraneous material from layer 14hi at the bottom of the page has been deleted;

reference number 12a is shown slightly above the center of the page;

references to pins in Figure 1 has been changed in the specification at applicable occurrences to references to locations.

With respect to Figure 2:

a rectangular block, a pointer, and a reference numeral 28 has been added representing connector straps or pads, wiring networks, etc. as described in the specification at page 4, lines 23-24 and in claim 11.

With respect to Figure 3:

a rectangular block, a pointer, and a reference numeral 28 has been added representing connector straps or pads, wiring networks, etc. as described in the specification at page 4, lines 23-24 and in claim 11.

With respect to Figure 4:

the edges of the powerplane 40 have been inserted and extended so that the lower right-hand portion of the figure is not cut off;

the coloring of the impedance variations and load locations of Figure 4 has been deleted. In doing so, however, Applicants maintain that the impedance variations 42 are not limited to the geometric openings presented but can be openings of different shapes and/or material of different resistivity than that of powerplane 40;

the specification has been amended to reflect the element and the reference numeral 50 now reference a socket module;

pointer lines have been inserted from reference numerals 20, 22, and 30 to the different holes on the powerplane;

the Examiner states that it is unclear what the shapes of 20 and 22 are. Respectfully, the specification states that the source locations (30) and load locations (20 and 22) be capable of receiving pins. The shape of the pins is not disclosed in the specification and it is known in the art that connector pins come in all kinds of shapes; circular, oval, octagonal, flat, etc. Applicants respectfully decline to limit the invention to a particular rendition and maintain that the source locations and the load locations are the same part as referenced in Figures 2, 3, and 4.

With respect to Figures 2, 3, and 4:

the Examiner has requested that the reference numerals 40 for powerplanes, the reference numerals 42 for the impedance variations, and the reference numerals for the source locations 30 and load locations 20, 22 be changed for each embodiment. Respectfully, applicants submit that the drawings comply with 35 U.S.C. §113; with 37 CFR 1.74 which states that "[w]hen there are drawings, there shall be a brief description of the several views of the drawings and the detailed description of the invention shall refer to the different views by specifying the numbers of the figures and to the different parts by use of reference letters or numerals (preferably the latter); and with the MPEP at 608.02(p)(4) which states "[t]he same part of an invention appearing in more than one view of the drawing must always be designated by the same reference character, and the same reference character must never be used to designate different parts. A powerplane 40 has been defined as a conductive layer for providing particular direct current (DC) voltage levels to the functional units. Page 4, lines 17-19. Impedance variations 42 throughout the drawings represent that which "balances the resistance of the powerplane 40 between source locations 20 and load locations 20, 22 as described herein below." (Specification at page 5, lines 9-10). Impedance variations 42 may be circular or noncircular, and the location of impedance variations 42 need not run substantially parallel to the load locations. (Specification at page 7, lines 6 through 22). Source locations 30 and load locations 20, 22 are defined as an array of locations which can vary for coupling the backplane 10 to functional units. Page 4, line 23 to page 5, line 25. Respectfully, source locations 30, load locations 20 and 22, powerplanes 40, and the impedance variations 42 represent the same part throughout the application regardless of the embodiment; thus, the figures are in compliance with the law, the regulations, and the policy of the patent office.

The Commissioner is authorized to charge any comparison fees associated with this submission to Deposit Account number 09-0465. A duplicate copy of this letter is provided.

Respectfully submitted,

By_____
Karuna Ojanen, Attorney
Registration No. 32,484

Telephone: 507.285.9003
Fax No.: 507.252.5345

PATENT

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James R Nock
(Signature)

James R. Nock
(Attorney Name)

AMENDMENT UNDER 37 CFR 1.121

In response to the Examiner's Notice to Applicant mailed May 9, 2000, with a period for response set to expire on June 9, 2000, please amend the application as follows:

IN THE SPECIFICATION:

On page 1, line 2, after "is a", please delete "divisional application under 37 CFR 1.53", and insert –continuation-in-part application under 37 CFR 1.53";

line 3, after "reference", please insert – in its entirety–.

On page 5, line 1, please delete "that are relatively near 20 and distant 22 to source pins 30." and insert – that will be mechanically and electrically positioned in relative near locations 20 and distant locations 22 to source locations 30. – ;

line 3, please delete "pins 20, 22 and the number of source pins" and insert –locations 20, 22 and the number of source locations –;

line 4, please delete "load pins 20," and insert –load locations 20,–;

line 7, please delete "pins 30 depends on similar variables. Load pins" and insert –locations 30 depends on similar variables. Load locations–;

line 8, please delete "pins" and insert –locations–;

line 10, please delete "pins" and insert –locations–;

line 11, please delete "pins" and insert –locations–;

lines 11-12, please delete "Figure 4 illustrates a circuit board 52 coupled to a socket module which is connected at load pins 20 to the powerplane 50.";

line 13, please delete "pins 20, 22 and source pins 30 are press fit" and insert –pins may be press fit into load locations 20, 22 and source locations 30 of backplane 10.–;

lines 14-15, please delete "into backplane 10. In alternative embodiments, the load pins 20, 22 and the source pins 30 may be soldered or bolted down to" and insert -- In the alternative embodiments, pins may be soldered or bolted down to load locations 20, 22 and source locations 30 of –; and

line 22, please delete "pins" and insert –vias–.

On page 6, lines 1-2, please delete "load pins 20, 22 and source pins 30" and insert –connecting pins at load locations 20, 22 and source locations 30–;

line 2, after "functional units.", please insert – A functional unit may also be coupled to the powerplane 40 by means of connector straps or pads or wiring networks 28.

Henceforth, it should be understood that the electrical characteristics of power distribution on the powerplane 40 to the load locations 20, 22 shall also apply to any load or functional unit coupled to the powerplane 40 with connector straps, pads, or wiring networks 28. – ;

line 9, please delete "pins" and insert –locations–;

line 10, please delete "pins" and insert –locations–;

line 13, please delete "pins" and insert –locations– at both occurrences;

line 14, please delete "pins" and insert –locations–;

line 15, please delete "pins" and insert –locations–;

line 16, please delete "pins" and insert –locations–;

line 18, please delete "pin" and insert –location–;

line 19, please delete "pin" and insert –location–;

line 20, please delete "pins" and insert –locations–;

line 21, please delete "pins" and insert –locations– at both occurrences;

line 22, please delete "pins" and insert –locations– at both occurrences;

line 24, please delete "pins" and insert –locations– at both occurrences; and

line 25, please delete "pins" and insert –locations– at both occurrences.

On page 7, line 1, please delete "load pin-to-source pin resistance for all load pins" and insert –load location-to source location resistance for all load locations–;

line 2, please delete "pin" and insert –location–;

line 3, please delete "pins" and insert –locations– at both occurrences;

line 4, please delete "pins" and insert –locations–;

lines 4-5, after "functional unit", please delete "receives a stable voltage level" and insert –placed anywhere on the powerplane 40 receives substantially the same voltage level irrespective of its position on the power plane –;

line 7, please delete "pins" and insert –locations– at both occurrences;

line 8, please delete "pins" and insert –locations–;

line 10, please delete "pins" and insert –locations–;

line 15, please delete "pins" and insert –locations–;

line 18, please delete "pins" and insert –locations– at both occurrences; and

line 20, please delete "pins" and insert –locations–.

At page 8, line 7, please delete "pins" and insert –locations–;

line 8, please delete "pins" and insert –locations–;

line 18, please delete "pins" and insert –locations– at both occurrences; and

line 20, after "layer.", please insert – Figure 4 illustrates a circuit board 52 coupled to a socket module 50 which is connected at load locations 20 to the powerplane 40. –

IN THE CLAIMS:

For the convenience of the Examiner and Applicants, all claims and any amendments are presented herein. Claims 2, 4-8, and 11 have been amended. Claim 14 has been added.

1.(Unchanged) A powerplane for use in a backplane power distribution system, comprising:

(a) a conductive sheet;

(b) at least one source location on said conductive sheet for coupling to a power source;

(c) a plurality of load locations on said conductive sheet for coupling to at least one load;

(d) a plurality of variable resistances between said at least one source location and said plurality of load locations to distribute substantially the same amount of current from said at least one source location to each of said plurality of load locations.

2.(Amended) A powerplane according to claim 1, wherein said [backplane] powerplane includes a plurality of load pins and [a plurality of source pins] at least one source pin and wherein said at least one source location and said plurality of load locations comprise vias for receiving a corresponding one of said [source pins] at least one source pin and said load pins, at least a portion of said vias having plated perimeters for electrically connecting said powerplane to said load pins and source pins.

3.(Unchanged) A powerplane according to claim 1, wherein said conductive sheet comprises copper.

4.(Amended) A backplane power distribution system for distributing power from a power source, comprising:

a laminate having

a plurality of interleaved dielectric layers and conductive layers wherein at least one of said conductive layers is [used as] a powerplane for distributing said power; and

a plurality of source locations and load locations, said source locations being provided to couple said powerplane to said power source and said load [pins] locations being provided to couple said powerplane to at least one load,

a plurality of variable resistances arranged on said powerplane to distribute current so the voltage difference between said load locations is reduced to near zero.

5.(Amended) A backplane power distribution system according to claim [11]4, wherein said source locations and said load locations define a plurality of holes passing through said laminate, said holes forming vias in each of said layers of said laminate, said vias being adapted to couple said [backplane] powerplane to said loads and said power source.

6.(Amended) A backplane power distribution system according to claim [14]5, wherein said laminate further includes source pins and load pins, and wherein a first number of said vias in at least one of said conductive layers are provided with plated perimeters for connection to said load pins and said source pins and a second number of said vias in said at least one of said conductive layer are provided with an insulated perimeter for insulating said second number of vias from said load pins and source pins.

7.(Amended) A backplane power distribution system according to claim [11]4, wherein said conductive layers comprise copper.

8.(Amended) A backplane power distribution system according to claim [11]4, wherein said load locations are provided to couple said powerplane to at least one circuit board.

9.(Unchanged) A powerplane for use in a backplane power distribution system, comprising:

(a) a conductive sheet;

(b) means to couple a power source to said conductive sheet;

(c) means to couple at least one load to said conductive sheet;

(d) means to distribute substantially the same amount of current from said power source to all of said at least one load.

10.(Unchanged) The powerplane of Claim 9, wherein said conductive sheet is copper.

11.(Amended) The powerplane of Claim 9, wherein said means to couple said power source and said means to couple said at least one load to said conductive sheet are selected from the group comprising: connector straps, pads, and vias which receive a plurality of source pins and a plurality of load pins[, respectively].

12.(Unchanged) The powerplane of Claim 9, wherein said means to distribute substantially the same amount of current further comprises a plurality of resistance variations in the structure of the powerplane.

13.(Amended) The powerplane of Claim 11, wherein

said plurality of load [pins] locations further comprises near load [pins] locations and distant load [pins] locations with said near load [pins] locations being nearer to said plurality of source [pins] locations than said distant load [pins] locations, and

wherein said means to distribute substantially the same amount of current further comprises:

means to variably increase the resistance of the powerplane between said plurality of source [pins] locations and said load [pins] locations, and

means to substantially reduce the voltage difference between said near load [pins] locations and said distant load [pins] locations.

–14.(New) A powerplane for use in a backplane power distribution system, comprising:

(a) a conductive sheet;

(b) at least one source location on said conductive sheet for coupling to a power source;

(c) a plurality of load locations on said conductive sheet for coupling to at least one load;

(d) a plurality of circular and non-noncircular resistances disposed on said conductive sheet at an angle other than parallel or perpendicular to said at least one source location. –

REMARKS

This application was filed on 07 May 1998 with a preliminary amendment claiming the priority date of U.S. Patent No. 5,841,074 filed on 12 March 1996. The Examiner did not enter the amendment stating that the text of the amendment did not correspond to the text of the parent application. The preliminary amendment did, in fact, amend the originally filed specification of the parent application, U.S. serial number 08/615,154, now issued as U.S. Patent No. 5,841,074 and those amendments were incorporated into the specification filed in this application.

In the first Examiner's Action of the application herein, the Examiner rejected claims 1-13 under 35 U.S.C. §112, second paragraph; and under 35 U.S.C. §112, first paragraph. The Examiner further separately rejected claims 9-13, 5, and 7-8 under 35 U.S.C. §112, first paragraph. Art was nevertheless applied and claims 1-2 and 4 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,523,921 to Van Lydegraf; and claim 3 was also rejected separately under 35 U.S.C. §103(a) as being unpatentable over Van Lydegraf '921. The Examiner further indicated that the subject matter of claims 9, 10-13, and 5, 7, and 8 is allowable, subject to the rejections under 35 U.S.C. §112, first and second paragraphs.

In a response mailed 10 February 2000, Applicants amended the specification and claims 2, 4-8, 11, and 13. The Examiner responded with a Notice to Applicants mailed 09 May 2000 stating that the amendment was not entered because allegedly "the amendments to the disclosure are not consistent with the disclosure on filed .... "

In response, Applicants respectfully submit this amendment which amends the specification and claims of the application filed on 07 May 1998 which incorporated the preliminary amendment. By way of the Examiner's suggestion, Applicants have amended the application to be a continuation-in-part application of the U.S. Patent No. 5,841,074. A new declaration and assignment are submitted. One independent claim has been added but Applicants have not added new matter. The new claim, claim 14, reads on Figure 3 and uses the language on page 7, lines 8-11. Claims 1-14 are pending in the application.

The Objection to the Drawings

In separate correspondence attached to this amendment, applicants submit a Proposed Amendment to the Drawing, complete with remarks addressing each of the Examiner's concerns.

Objections to the Specification

In paragraph 6 of the Examiner's Action mailed 10 December 1999, the Examiner objected to the specification.

First, the Examiner stated that source pins (30) are recited although no explanation is given as to what they are. In the objection to the drawing, the Examiner further states that no pins are shown in the figures. In response, throughout the specification, when referring to those locations into which electrical contact for a source and/or a load is to be made, the word "pin" has been changed to "location" and the word "pin" is left to mean "one of a conducting contact of an electrical connector." IBM DICTIONARY OF COMPUTING, McGraw-Hill, Inc. (1993) at 512.

The Examiner said that the last sentence of the first paragraph on page 5 was confusing. Applicants have deleted the sentence and have moved an amended sentence to page 8 of the specification.

The Examiner objected to use of the reference numbers (40) and (50) as referring to the power plane. The Examiner is correct and Applicants have amended the specification to reflect that the reference numeral 50 refers to the socket module in Figure 4 and the reference numeral 40 refers to the powerplane.

Applicants respectfully decline to amend the specification as suggested by the Examiner to insert "figures 2 and 4" on page 6, line 11 of the specification. The specification in the first paragraph refers specifically to Figure 2.

The Examiner did not understand what is meant by "stable" on page 7, line 5 of the specification. In response, Applicants have amended the sentence. No new matter has been added because the sentence paraphrases the previous sentence in the paragraph.

The Examiner has suggested that the abstract be amended and that the phrase "near zero" be stricken at the end of the abstract. The invention is described in these terms, as set forth in the specification on page 7, lines 2-4. Respectfully, Applicants decline the Examiner's suggestion and request the Examiner to withdraw this objection.

In paragraph 7, the Examiner further objected to the specification and the drawings for allegedly not showing every element of the claimed invention. Specifically, the Examiner said that the conductive sheet of (a) in claim is not shown or described with respect to the present invention. Respectfully, applicants believe that the conductive sheet is shown and described. On page 4, lines 16-19, the specification states, "[S]ome of the **conductive layers** 12a-i may be signal layers for signal propagation while others layers may be **powerplanes** for providing particular direct current (DC) voltage levels to the functional units." (emphasis added) The powerplane (40) shown in Figure 2, Figure 3, and Figure 4 is a conductive sheet or a

conductive layer. Respectfully, applicants request the Examiner to withdraw this objection to claim 1.

The Examiner further states that the source pins of claim 2 are not shown. With the amendments to the specification, source locations (30) are shown in Figure 2, Figure 3, and Figure 4, and are described in the specification on page 5. Applicants respectfully request the Examiner to withdraw this objection to claim 2.

The Examiner further states that the laminate and its layers, as in claim 4, are not shown. Again, respectfully, applicants request the Examiner to withdraw the objection. Figure 1 illustrates a laminated structure comprising a plurality of alternating conductive layers and interweaved dielectric layers, page 4, lines 4-6. One of those conductive layers may be a powerplane as shown in Figures 2 through 4. Therefore, the specification and the drawings show the claimed element of the plurality of interleaved dielectric layers and conductive layers.

The Examiner states that the connector straps and pads of claim 11 are not shown. Figure 2 and its description in the specification have been amended to shown connector straps or pads, wiring networks, etc. 28. By amending Figure 2 and the specification, applicants have not added new matter. Connector straps and pad were in the originally filed specification of the parent application on page 5, line 32 through page 6, line 1 and in the specification filed of this application on page 4, lines 23-24. Conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol or a labeled representation (e.g., a labeled rectangular box). 37 CFR 1.83(a).

The Examiner states that the following elements of claim 13 are not shown: the means to variable increase the resistance of the powerplane between said plurality of source pins and said load pins, and the means to substantially reduce the voltage difference between the voltage difference between said near load pins and said distant load pins. Respectfully,

applicants direct the Examiner's attention to page 6, line 18 through page 7, line 22, in which describe the structure and the operation of how the resistance between the plurality of source pins and load pins can variably increase and how the voltage difference between near load pins and distant load pins is substantially reduced. To reiterate, page 7, lines 20-22 state that "resistances or impedance variations may represent voids or nonconductive materials or variations in the thickness of the powerplane 40 as described above." Applicants request the Examiner to withdraw the objection to claim 13.

REJECTION OF THE CLAIMS

In the Examiner's Action mailed 10 December 1999, the Examiner also rejected Claims 1-13 under 35 U.S.C. §112, first and second paragraphs. Each of these rejections will be addressed separately.

35 U.S.C. §112, second paragraph, rejection of Claims 1-13

In claims 1 and 4, the Examiner asserts that the "even distribution of current" is indefinite because it is unclear what constitutes even. Respectfully, applicants request the Examiner to withdraw this rejection because neither claim 1 nor claim 4 claims an "even distribution of current." Applicants respectfully request clarification from the Examiner.

In claim 1, the Examiner states that a "plurality of variable resistances" is misdescriptive because each of the resistances is not variable. Respectfully, applicants maintain that the resistances may indeed be variable because if one resistance is circular and if another resistance is noncircular, or if one resistance is a void and another resistance is a nonconductive material or a variation in the thickness of the powerplane, then the resistances will indeed be variable. A singly provided impedance variation or resistance will have a electrical resistance that varies from one in multiple rows. Applicants respectfully request the Examiner to withdraw this rejection of claim 1.

The Examiner rejected claim 2 and offered possible corrections to overcome the rejections. Applicants have amended the claim according to the Examiner's suggestions and thank the Examiner. Thus, applicants respectfully request the Examiner to withdraw the rejection of claim 2.

The Examiner rejected claim 4 as being indefinite because of the use of the term "powerplane" as not being consistent with the specification. Throughout the specification the term "powerplane" was used, e.g., page 1, lines 13-15 ([O]ther conductive layers [of the backplane] are used to distribute the power necessary for system operation. These conductive layers are known in the art as powerplanes ....); page 2, line 3; page 2, line 8; page 2, line 20; page 3, lines 5-8; page 3, line 15, page 3, line 18; page 3, line 21; page 4, line 18 (Some of the conductive layers 12a-i may be signal layers for signal propagation while other layers may be powerplanes for providing particular direct current (DC) voltage levels to the functional units .... In the exemplary embodiment, conductive layers 12a and 12i are signal layers and layers 12b-h are powerplanes.); page 4, lines 20-21; page 6, lines 1-5 (Figure 2 illustrates an exemplary powerplane 40 ... for distributing power ...); page 5, lines 9-14; page 7, line 11-22, etc. Applicants respectfully believe that the powerplane as claimed in claim 4 is consistent with the specification and request clarification if the Examiner maintains the rejection.

The dependency of claims 5-8 has been corrected and applicants apologize for the errors. Respectfully, proper antecedent basis has been provided in these claims and they are dependent upon independent claim 4.

The Examiner stated that claim 8 was indefinite because it recites details of the load not claimed in claim 4. Respectfully, claim 8 has been amended to specify a further limitation on the subject matter claimed: a load location being provided to couple said powerplane to at least one circuit board. Applicants respectfully request the Examiner to withdraw the rejection of amended claim 8.

The Examiner rejects claim 9 and claim 13 under 35 U.S.C. §112, second paragraph alleging that it is unclear which elements of the invention particular "means" pertain to or what exactly constitutes the "means." Respectfully, claims 9 and 13 are clear on their face in view of 35 U.S.C. §112, sixth paragraph which states"[A]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." Applicants are not required to set forth the structure of the "means to distribute substantially the same amount of current from said power source to all of said at least one load" (claim 9) or the means to variable increase the resistance of the powerplane between said plurality of source means and said load pins, and means to substantially reduce the voltage difference between said near load pins and said distant load pins" (claim 13) in the claims themselves. Applicants respectfully submit that the specification provides sufficient disclosure for the structure and the equivalents thereof on pages 6 and 7 of the specification. Applicants respectfully request the Examiner to withdraw this rejection of claim 9 and 13.

The Examiner further rejects claim 9, 12, and 13 stating that it is unclear what range "substantially" contemplates. Independent claim 9 and 12 set forth, *inter alia,* a "means to distribute substantially the same amount of current from said power source to all of said at least one load." Substantially in claims 9 and 12 are used according to the second definition of substantially given in THE ENCARTA WORLD ENGLISH DICTIONARY, St. Martin's Press (1999) at 1781 in which *substantially* is "essentially, generally or in essence." In a real world with a real power source on a real conductive sheet coupled to real loads, it is difficult to distribute *exactly* the same current to all the loads located from the power source; but given the teachings of the invention to create variable impedances between the source and multiple loads, it is possible to distribute *substantially* the same current to any load irrespective of its position on the conductive sheet. Claim 13 provides for means to substantially reduce the voltage difference between said near load pins and said distant load pins. Similarly, in a real world it is virtually impossible to exactly reduce the voltage difference between said near load pins and said distant load pins to zero and so the first definition of substantially as given in THE ENCARTA WORLD ENGLISH DICTIONARY, St. Martin's Press (1999) at 1781 in which

substantially is "considerable in an extensive, substantial, or ample way" does particularly point out and distinctly claim the subject matter, given the plain meaning of the word "substantially."

The Examiner also rejected claim 13 because the means to variably increase resistance is indefinite. As stated above in the Examiner's objection to claim 13, applicants respectfully refer to page 6, line 18 through page 7, line 22, which describe the structure and function of how the resistance between the plurality of source pins and load pins can variably increase. Page 7, lines 20-22 state that "resistances or impedance variations may represent voids or nonconductive materials or variations in the thickness of the powerplane 40 as described above." Applicants respectfully request the Examiner to withdraw the rejection to claim 13 on this basis.

35 U.S.C. §112, first paragraph, rejection of Claims 1-13

In paragraph 11 of the Examiner's Action, the Examiner rejected claim 4, stating that the voltage difference being near zero is not described in the specification and it is unclear what range is contemplated by "near zero." The specification at page 7, lines 2-4 states that, "[A]ccordingly, current is shared more evenly between load pins 20, 22 and the voltage difference between distant load pins 22 and near load pins 20 is reduced to **near zero**." Respectfully, as stated above, it is virtually impossible in a real world given a real conductive sheet with a real power source and a real load to reduce the voltage difference to exactly zero; therefore one of ordinary skill in the art will appreciate that given the specifications for and the electrical and physical characteristics of the power source, the conductive sheet, the loads, he/she is enabled to reduce the voltage difference between near loads and far loads to near zero or that substantially the same current will be applied to the near and far loads, using the teaching of the invention. Applicants respectfully request the Examiner to withdraw the rejection of claim 4 on these grounds.

The Examiner further rejects claim 1 stating that the conductive sheet is not shown and described with respect to the present invention. As set forth above, applicants believe that the conductive sheet is shown and described. On page 4, lines 16-19, the specification states,

"[S]ome of the **conductive layers** 12a-i may be signal layers for signal propagation while others layers may be **powerplanes** for providing particular direct current (DC) voltage levels to the functional units." (emphasis added) The powerplane (40) shown in Figure 2, Figure 3, and Figure 4 is a conductive sheet or a conductive layer. Respectfully, applicants request withdrawal of this rejection of claim 1.

The Examiner further rejects claim 4 asserting that the laminate and its layers, as in claim 4, are not shown. Again, respectfully, applicants request the Examiner to withdraw the rejection. Figure 1 illustrates a laminated structure comprising a plurality of alternating conductive layers and interleaved dielectric layers, page 4, lines 4-6. One of those conductive layers may be a powerplane as shown in Figures 2 through 4. Therefore, the specification and the drawings show the claimed element of the plurality of interleaved dielectric layers and conductive layers.

The Examiner states that the connector straps and pads of claim 11 are not disclosed. Respectfully, connector straps and pad were disclosed in the originally filed specification of the parent application on page 5, line 32 through page 6, line 1 and in the specification filed of this application on page 4, lines 23-24. Figure 2 and its description in the specification have been amended to shown connector straps or pads, wiring networks, etc. 28. By amending Figure 2 and the specification, applicants have not added new matter.

The Examiner states that the variable resistances as claimed in claim 1 and the means to variably increase the resistance as recited in claim 13, line 7 are not disclosed. Respectfully, applicants direct the Examiner's attention to page 6, line 18 through page 7, line 22, in which describe the structure and the operation of how the resistance between the plurality of source pins and load pins can variably increase and how the voltage difference between near load pins and distant load pins is substantially reduced. Quite simply put, on page 7, lines 20-22 state that "resistances or impedance variations may represent voids or nonconductive materials or variations in the thickness of the powerplane 40 as described above." Further, 35 U.S.C. §112, sixth paragraph does not require that the structure be set

forth in claims 9 and 13 which it appears the Examiner is requiring. Applicants respectfully request the Examiner to withdraw the rejections to claim 1, claim 9, and claim 13.

Rejection of Claims 1-4 under 35 U.S.C. §§ 102(e) and 103(a)

The Examiner further rejected claims 1-2 and 4 under 35 U.S.C. §102(e) and claim 3 under 35 U.S.C. §103(a) in view of U.S. Patent No. 5,523,921 to Van Lydegraf ('921). Applicants respectfully traverse the rejections.

The '921 patent cannot anticipate applicants' invention as claimed in independent claims 1 and 4 and dependent claim 2 because it lacks a claimed element (d), i.e., *a plurality of variable resistances between said at least one source location and said plurality of load locations* ***to distribute substantially the same amount of current from said at least one source location to each of said plurality of load locations.***

The '921 patent teaches a plurality of apertures on a ground or power plane to create **an isolation effect** between two circuits on the plane. Column 3, lines 45-47. In other words, [r]egardless of the pattern of the reference grid, ... the idea is to **separate the I/O circuitry currents from the rest of the PCA circuit** currents in such a way as to minimize the I/O reference plane/grid common mode potential (column 4, lines 16-19) .... It can be said that reference plane 42 is **divided and isolated** by slots 40 into an I/O reference plane 44 and a circuit reference plane 46. (Column 4, lines 37-39) Thus, the apertures of the '921 are to create or separate current between loads on a conductive plane rather than to distribute the same current to loads on the plane, as applicable to applicants' claim 1, or to distribute current so that the voltage difference between the load locations is reduced to near zero, as applicable to claim 4. Thus, the '921 patent cannot anticipate either independent claim 1 or independent claim 4 because the same current is not distributed to the loads on a conductive plane. Applicants respectfully request the Examiner to withdraw the rejection of claims 1, 2, and 4 under 35 U.S.C. 102(e).

The '921 patent cannot be used, moreover, to render applicants' claimed invention, as in claims 1-4, obvious because the very purposes of the two patents are at odds with each. One of ordinary skill in the art would not look to the '921 patent which teaches using apertures to electrically isolate circuits from each other on a conductive plane to using apertures on a conductive plane to provide substantially the same current to any load on the conductive sheet such that the voltage difference between the loads is reduced to near zero. Isolation of current between circuits or loads on the same conductive sheet is contrary to providing the same current from the same source to circuits or loads on the same conductive sheet. Respectfully, applicants request the Examiner to withdraw the rejection of claim 3 and any possible rejection of claims 1, 2, and 4 under 35 U.S.C. §103(a).

The Examiner stated that claims 9-13 and claims 5, 7, and 8, if they were dependent upon claim 9, contained allowable subject matter.

CONCLUSION

Applicants submit that the remarks and amendments to the specification overcome any objection to the specification and resulting rejection of the claims under 35 U.S.C. §112. With respect to the rejection under 35 U.S.C. §§ 102(e) and 103(a) based on Van Lydegraf '921, Applicants traverse the rejection because Van Lydegraf '921 does not disclose or suggest having variable resistances to distribute substantially the same amount of current from a source to each load on a conductive sheet; nor does Van Lydegraf '921 disclose or suggest variable resistances to distribute current so the voltage difference between loads on a conductive sheet is reduced to near zero.

Upon considering this amendment, the Examiner is respectfully urged to call the Applicants' attorney at the number below if any changes or corrections are deemed necessary for allowance of the present application. Applicants respectfully request reconsideration and an early allowance of the application by the Examiner.

Respectfully submitted,

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BACKPLANE POWER DISTRIBUTION SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application is a divisional application under 37 CFR 1.53 of 08/615,154 filed 12 March 1996, which is hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates generally to computer system backplanes and, more particularly, to powerplanes for distributing power in backplanes.

BACKGROUND OF THE INVENTION

A computer system backplane typically is a multi-layer substrate comprising a plurality of conductive layers interweaved with a plurality of dielectric layers. The backplane carries a plurality of parallel multiterminal sockets that receive in an edgewise manner circuit boards on which computer system components are constructed. Some of the backplane conductive layers are used for signal propagation. Other conductive layers are used to distribute the power necessary for system operation. These conductive layers are known in the art as powerplanes and are generally in the form of solid sheets of conductive material such as copper.

Each multiterminal, socket typically includes a plurality of pins which pass through small, plated vias bored through the layers of the backplane. Each pin makes contact with a desired one of the backplane conductive layers. Where no connection to a particular conductive layer is desired, a region surrounding the via through that conductive layer is insulated to prevent the pin from making contact. The plated vias

are sized relative to the connector pins for a press fit. Power supply connections are made in a generally similar manner.

In each powerplane, some of the plated vias make contact with load pins, i.e., pins coupled to the circuit boards received by the sockets. Other vias are connected to source pins coupled to a power supply.

It will be appreciated that due to design constraints the source pins are not always centered between the load pins, leading to unequal distribution of current over the powerplanes and unequal current sharing among the load pins. For example, load pins having a shorter linear distance to the source pins will have a lower resistance with respect to the source pins and thus will source more current than load pins further from the source pins. To avoid exceeding the current rating of the load pins closest to the power source, smaller power levels are required. This results in inefficient use of the current sourcing capacity of the for distant load pins.

An attempt to equally distribute current has been made using a stepped backplane configuration. See U.S. Patent No. 4,450,029 to Holbert et al. In a stepped backplane, the conductive and dielectric layers are laminated while having the same transverse extent. An edge of the backplane is then milled to expose the conductive layers in a stepped fashion. Rectangular bus bars are then mounted to the exposed conductive layers to provide a parallel power distribution. The step backplane however fails to provide equal current over the length of the powerplanes and thus fails to provide equal current to each load pin. Moreover, stepped backplanes are costly as they require post lamination milling.

Consequently, there exists in the industry a need to provide a cost effective method for evenly distributing current to the load pins of a powerplane. The present invention addresses this need as well as other needs.

SUMMARY OF THE INVENTION

The present invention is a powerplane for use in a backplane power distribution system. The backplane includes a conductive sheet for distributing power from a power source to a load. The powerplane further includes source locations and load locations for coupling the conductive sheet to a power source and a load. The conductive sheet is provided with impedance variations for balancing the resistance of the conductive sheet between the source locations and load locations, thereby promoting even distribution of current to the load locations.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectioned, perspective view of a conventional backplane with a thickness greatly exaggerated relative to the transverse dimensions; and

Figure 2 is a plan view of an exemplary powerplane conductive layer of a backplane showing the structural features of an embodiment of the invention to vary the resistance along the dimensions of the backplane;

Figure 3 is a plan view of a powerplane conductive layer of a backplane showing the structural features of an alternative embodiment of the invention to vary the resistance along the dimensions of the backplane; and

Figure 4 is a perspective view of a circuit board coupled to the powerplane.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring now to the drawings, and more particularly to Figure 1, there is shown a backplane 10 for use in a system requiring power distribution, e.g., a computer system. Backplane 10 is typically a laminated structure comprising a plurality of alternating conductive layers 12a-i and interweaved dielectric layers 14ab, 14bc,... and 14hi. The conductive layers may be implemented with copper, gold, silver-palladium, alloy, tungsten, etc. The dielectric layers may be fiberglass-epoxy composites. It is noted that the conductive and dielectric layers have been numbered such that each conductive layer has a single letter associated with it and each dielectric layer has associated therewith the two letters that are associated with the immediately neighboring conductive layers. The conductive layers may be less than 50 microns thick. Thus, it is important to note that the thickness of backplane 10 has been exaggerated in order to show the conductive and dielectric layers clearly.

Backplane 10 provides electrical communication between a power source and various functional units or loads. For example, in a computer system, the functional units may be circuit boards carrying electrical components. Some of the conductive layers 12a-i may be signal layers for signal propagation while other layers may be powerplanes for providing particular direct current (DC) voltage levels to the functional units. For example, in computer systems, the DC voltage levels are typically 5 volts, 3.3 volts, or even lower. In the exemplary embodiment, conductive layers 12a and 12i are signal layers and layers 12b-h are powerplanes.

Backplane 10 is provided with an array of locations for coupling the backplane 10 to functional units. For example, the locations may be connector straps or pads, wiring networks, etc. In the exemplary embodiment, the locations are holes or vias 15

which receive load pins that are relatively near 20 and distant 22 to source pins 30. The formation of vias 15 is described more fully hereinbelow. The number of load pins 20, 22 and the number of source pins 30 vary according to the environment in which backplane 10 is used. In computer systems, the number of load pins 20, 22 depends on the number of circuit boards to be plugged in backplane 10 as well as the power requirements of the circuit boards and the current carrying capability of the pins. The number of source pins 30 depends on similar variables. Load pins 20, 22 and source pins 30 extend through the layers of backplane 10 and into sockets mounted on backplane 10. The sockets may include resilient contacts for coupling the contacts on a functional unit, e.g., a circuit board or a power supply, to load pins 20, 22 or source pins 30. Figure 4 illustrates a circuit board 52 coupled to a socket module which is connected at load pins 20 to the powerplane 50.

In the exemplary embodiment, load pins 20, 22 and source pins 30 are press fit into backplane 10. In alternative embodiments, the load pins 20, 22 and the source pins 30 may be soldered or bolted down to the backplane 10, or the functional units may contain the pins for insertion into the array of vias 15 provided by backplane 10. Vias 15 may be plated so that a corresponding pin makes contact with a desired one of the backplane conductive layers, whether a signal layer or a powerplane, as shown as 18b and 18h on Figure 1 where plated vias contact conductive layer 12b and 12h, respectively. Where connection to a given layer is not desired, a region may be provided surrounding the hole through that particular conductive layer to insulate the conductive layer from the pin. Thus, backplane 10 has an array of pins passing through the powerplanes but making electrical contact with only certain conductive layers.

Figure 2 illustrates an exemplary powerplane 40 receiving load pins 20, 22 and source pins 30 for distributing power from a power source to functional units. Powerplane 40 is provided with the array of vias 15 as mentioned above and a plurality of resistances or impedance variations 42. In powerplanes, there is very little inductance, so the terms resistance and impedance are used interchangeably. Balancing the resistance is the main objective because by doing so, this will balance the current. It is also true, however, to say that the impedance is balanced because both the inductive part and the resistive part of the impedance will be balanced. Impedance variations 42 balance the resistance of powerplane 40 between source pins 30 and load pins 20, 22 as described hereinbelow. As shown in the exemplary embodiment of Figure 2, impedance variations 42 may be rectangular voids in the conductive sheet comprising powerplane 40 and may be provided in multiple rows, extending parallel to load pins 20, 22 and disposed between load pins 20 and source pins 20. Furthermore, in the exemplary embodiment, impedance variations 42 are spaced more closely near source pins 30 with the spacing gradually increasing as impedance variations 42 move further from source pins 30, i.e., d_1 is less than d_{x+1} is less than d_{n-1} is less than d_n, as illustrated in Figure 2.

It should be appreciated that the resistance between a load pin 20, 22 and a source pin 30 is a function of the resistivity and dimensions of the conductive material between the pins. In conventional powerplanes, i.e., those without impedance variations 42, load pins further from source pins have a higher resistance than load pins closer to source pins. This results from the increased length of the conductive material. By providing impedance variations 42 having an increasing spacing as described above, the resistance between source pins 30 and near load pins 20 increases relative to the resistance between source pins 30 and distant load pins 22. This

provides a more even load pin-to-source pin resistance for all load pins without changing the design of the pin layout. Accordingly, current is shared more evenly between load pins 20, 22 and the voltage difference between distant load pins 22 and near load pins 20 is reduced to near zero. As a result, the functional unit receives a stable voltage level for more reliable operation.

It is noted that the characteristics and/or location of impedance variations 42 may vary, provided the resistance between load pins 20, 22 and source pins 30 is substantially the same for all load pins 20, 22. For example, impedance variations 42 may be circular or noncircular, and the location of impedance variations 42 need not run substantially parallel to the load pins. In addition, impedance variations 42 may be provided singly or in multiple rows. Moreover, rather than being voids in powerplane 40, impedance variations 42 may be comprised of nonconductive material, or even conductive material having a resistivity greater than the resistance of the surrounding sheet, provided that in the later instance, the spacing between impedance variations 42 decreases as impedance variations 42 move away from source pins 30. In other embodiments, impedance variations 42 may comprise variations in the thickness of powerplane 40. For example, powerplane 40 may be thinner near source pins 30 and gradually thicken as it moves further from source pins 30. Figure 3 illustrates examples of noncircular resistances or impedance variations 42 which are not necessarily parallel to load pins 30. In Figure 3, resistances or impedance variations may represent voids or nonconductive materials or variations in the thickness of the powerplane 40 as described above.

Some of the above described structural features may be better understood with reference to an exemplary fabrication sequence. The first step involves providing the

conductive and dielectric layers for lamination. These layers may be provided as separate conductive and dielectric layers, or as a number of composite or dielectric only layers. Composite layers may include a copper-dielectric composite or a copper-dielectric-copper composite. In the latter composite, the dielectric layer is prepreg material having outer gel-cured layers and an inner completely cured layer.

Prior to lamination of all the layers to form the backplane, each conductive layer 12a-i is etched with an appropriate pattern. As noted above, load pins 20, 22 and source pins 30 typically pass through all the conductive layers 12a-i. Where a connection of a pin to a given layer is not desired, the etching step may remove appropriate material in the vicinity of a via 15 for the particular pin. During the etching step, impedance variations 42 may also be etched. Advantageously, no additional expense would be incurred by providing impedance variations 42 during etching. It is noted that impedance variations 42 may alternatively be provided, for example, by using a release agent such as silicone-impregnated tape or by providing a conductive material having a different resistivity than that of surrounding powerplane 40.

After etching, the various layers are laminated under heat and pressure to form a single rigid assembly. Vias 15 for load pins 20, 22 and source pins 30 may then be drilled through the rigid laminated structure and plated to facilitate contact to a desired conductive layer.

It will, of course, be understood that various modifications and additions can be made to the embodiments discussed herein above without parting from the scope or spirit of the present invention. For example, the powerplane may be employed in

other systems requiring power distribution, such as telecommunications systems, local area networks, programmable logic controllers, etc. Accordingly, the scope of the present invention should not be limited to the particular embodiments discussed above, but should be defined only by full and fair scope of the claims set forth below.

CLAIMS

What is claimed is:

1. A powerplane for use in a backplane power distribution system, comprising:
   (a) a conductive sheet;
   (b) at least one source location on said conductive sheet for coupling to a power source;
   (c) a plurality of load locations on said conductive sheet for coupling to at least one load;
   (d) a plurality of variable resistances between said at least one source location and said plurality of load locations to distribute substantially the same amount of current from said at least one source location to each of said plurality of load locations.

2.(formerly Claim 8) A powerplane according to claim 1, wherein said backplane includes a plurality of load pins and a plurality of source pins and wherein said at least one source location and said plurality of load locations comprise vias for receiving a corresponding one of said source pins and said load pins, at least a portion of said vias having plated perimeters for connecting said powerplane to said load pins and source pins.

3. (formerly Claim 10) A powerplane according to claim 1, wherein said conductive sheet comprises copper.

4.(formerly Claim 11) A backplane power distribution system for distributing power from a power source, comprising:

a laminate having

a plurality of interleaved dielectric layers and conductive layers wherein at least one of said conductive layers is used as a powerplane for distributing said power; and

a plurality of source locations and load locations, said source locations being provided to couple said powerplane to said power source and said load pins being provided to couple said powerplane to at least one load,

a plurality of variable resistances arranged on said powerplane to distribute current so the voltage difference between said load locations is reduced to near zero.

5.(formerly Claim 14) A backplane power distribution system according to claim 11, wherein said source locations and said load locations define a plurality of holes passing through said laminate, said holes forming vias in each of said layers of said laminate, said vias being adapted to couple said backplane to said loads and said power source.

6.(formerly Claim 15) A backplane power distribution system according to claim 14, wherein said laminate further includes source pins and load pins, and wherein a first number of said vias in said conductive layers are provided with plated perimeters for connection to said load pins and said source pins and a second number of said vias in said conductive layer are provided with an insulated perimeter for insulating said second number of vias from said load pins and source pins.

7.(formerly Claim 16) A backplane power distribution system according to claim 11, wherein said conductive layers comprise copper.

8.(formerly Claim 17) A backplane power distribution system according to claim 11, wherein said at least one load comprises at least one circuit board.

9.(New) A powerplane for use in a backplane power distribution system, comprising:

(a) a conductive sheet;

(b) means to couple a power source to said conductive sheet;

(c) means to couple at least one load to said conductive sheet;

(d) means to distribute substantially the same amount of current from said power source to all of said at least one load.

10.(New) The powerplane of Claim 9, wherein said conductive sheet is copper.

11.(New) The powerplane of Claim 9, wherein said means to couple said power source and said means to couple said at least one load to said conductive sheet are selected from the group comprising: connector straps, pads, and vias which receive a plurality of source pins and a plurality of load pins, respectively.

12.(New) The powerplane of Claim 9, wherein said means to distribute substantially the same amount of current further comprises a plurality of resistance variations in the structure of the powerplane.

13.(New) The powerplane of Claim 11, wherein

said plurality of load pins further comprises near load pins and distant load pins with said near load pins being nearer to said plurality of source pins than said distant load pins, and

wherein said means to distribute substantially the same amount of current further comprises:

means to variably increase the resistance of the powerplane between said plurality of source pins and said load pins, and

means to substantially reduce the voltage difference between said near load pins and said distant load pins.

BACKPLANE POWER DISTRIBUTION SYSTEM
ABSTRACT OF THE DISCLOSURE

A powerplane for use in a backplane power distribution system. The backplane includes a conductive sheet for distributing power from a power source to a load. The powerplane further includes source locations and load locations for coupling the conductive sheet to a power source and a load. The conductive sheet has resistances with appropriate spacing and dimensions so that the resistance near the source locations is greater than the resistance farther away from the source locations. Thus, current is shared more evenly between all the load locations, and the voltage difference between distant load locations and near load locations is reduced to near zero.

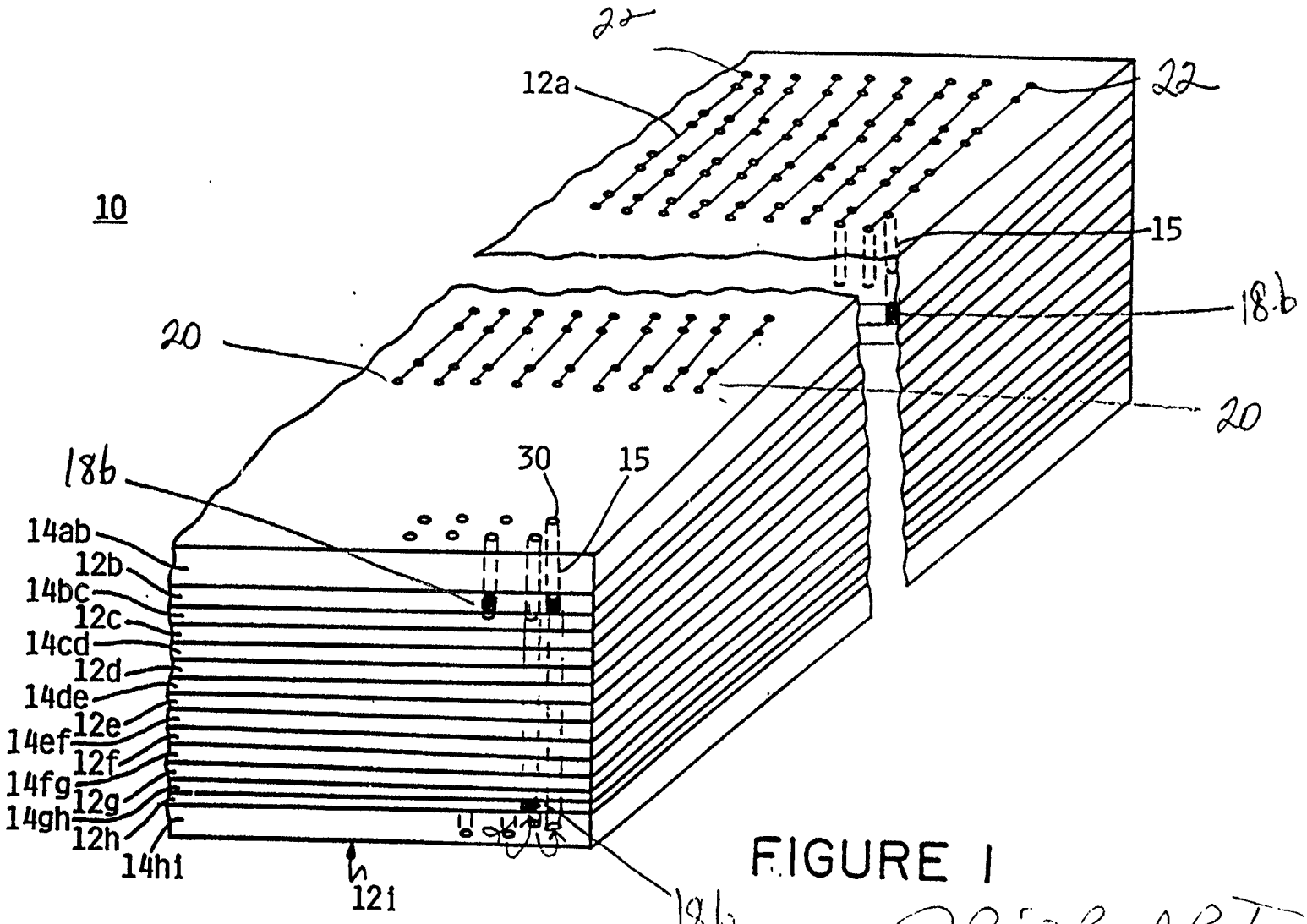

FIGURE 1

PRIOR ART

B0995-12B

R0995-122

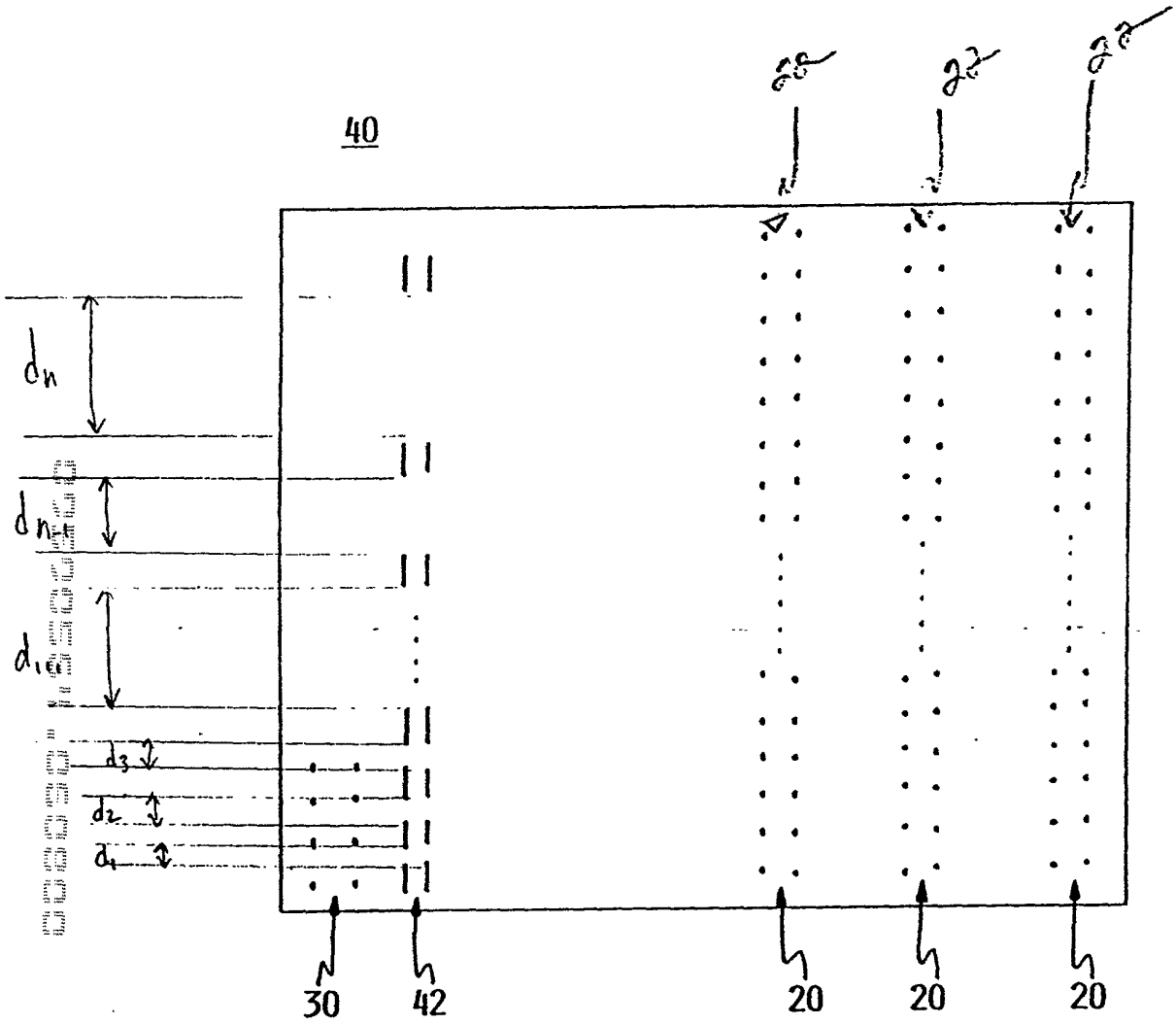

FIGURE 2

P1995-122B

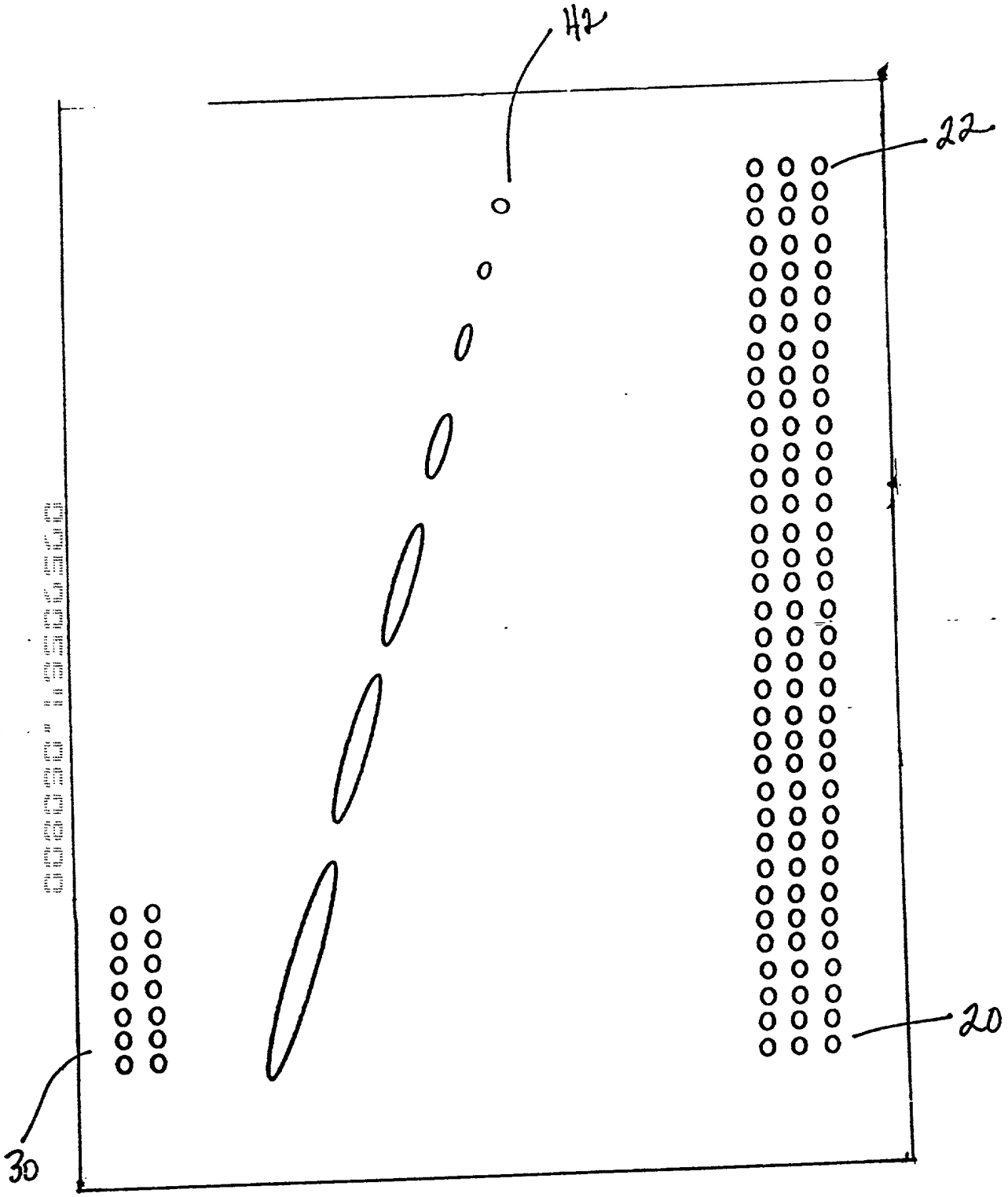

Figure 3

Sheet 3 of 4
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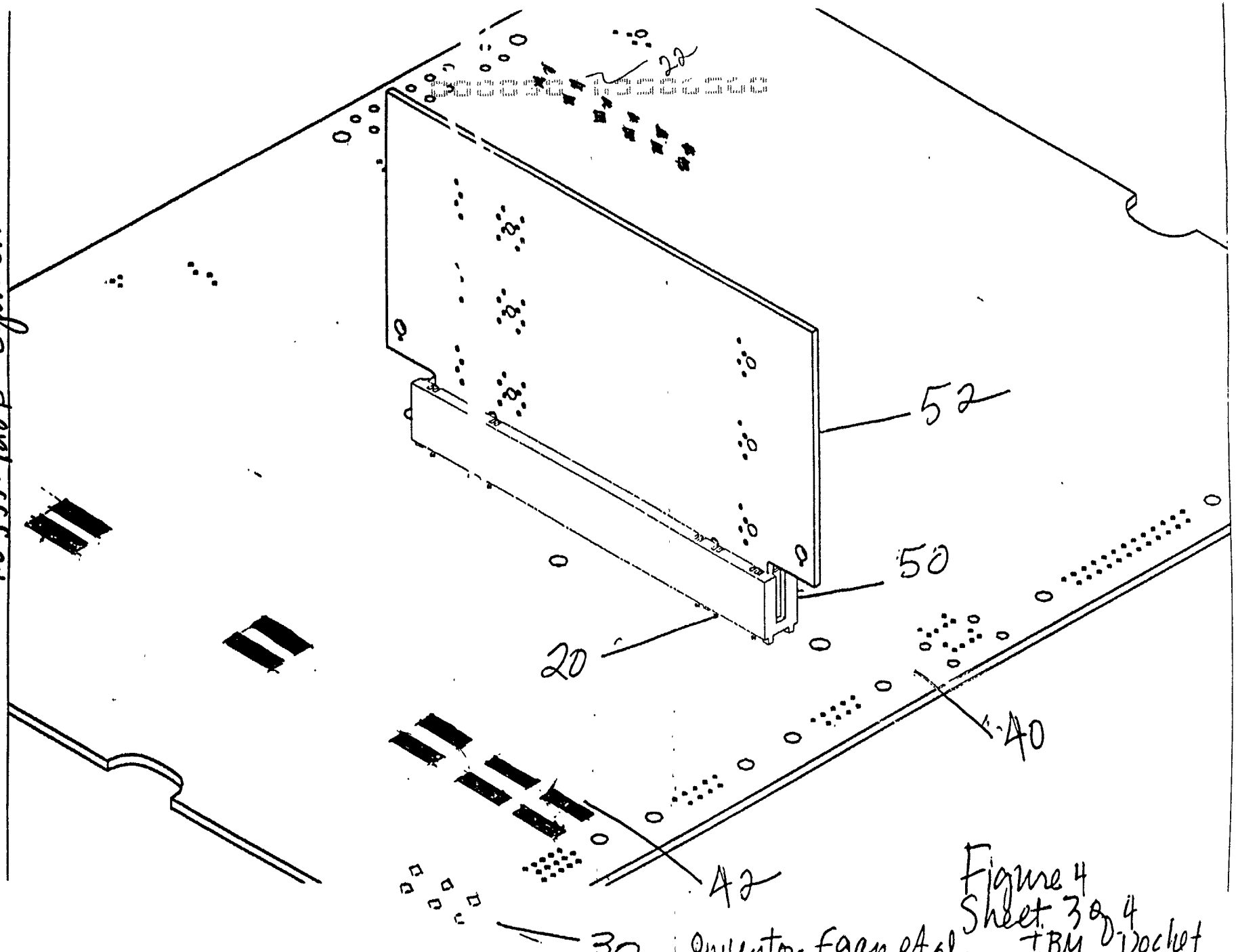

Figure 4
Sheet 3 of 4
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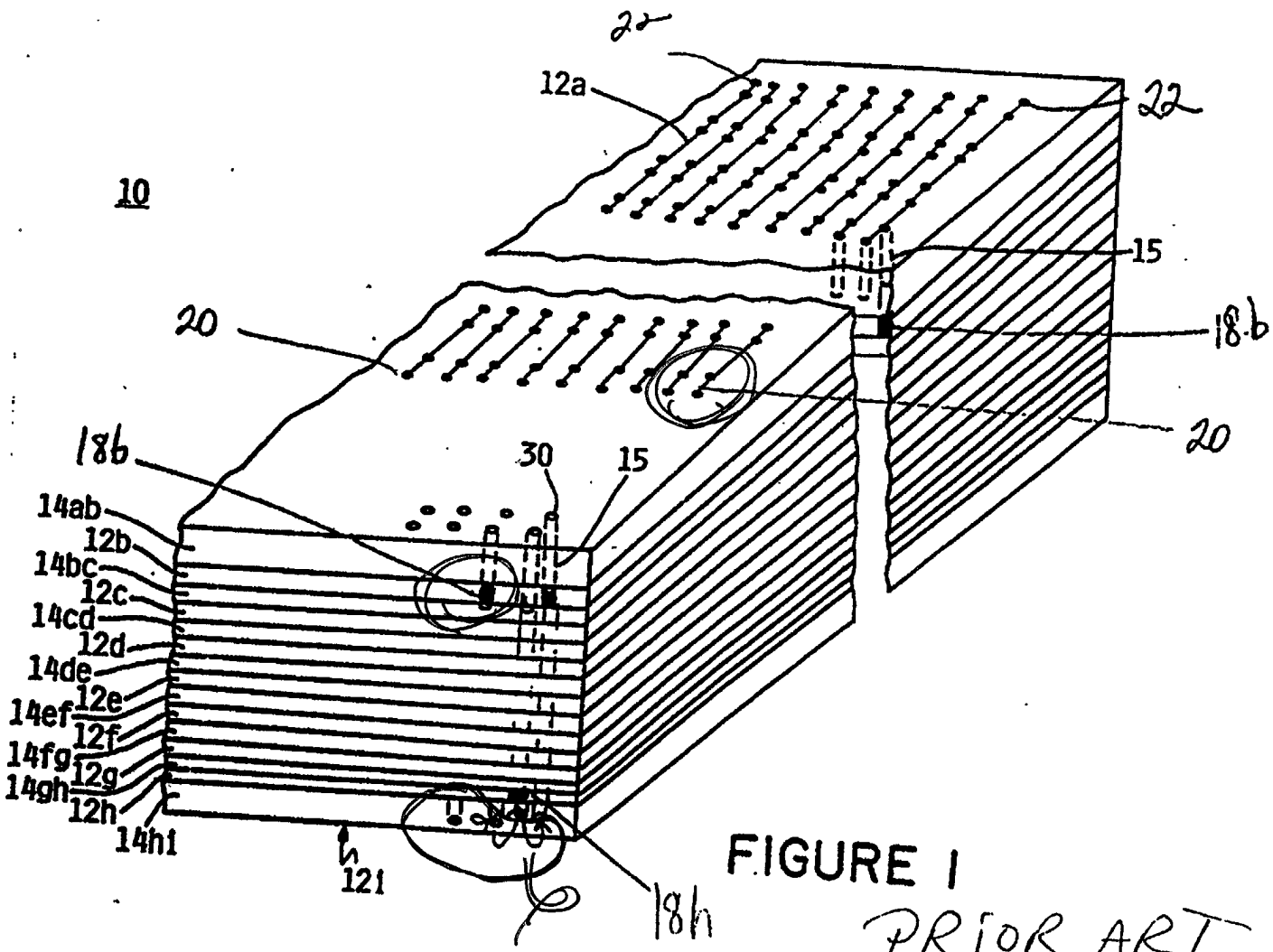

FIGURE 1

PRIOR ART

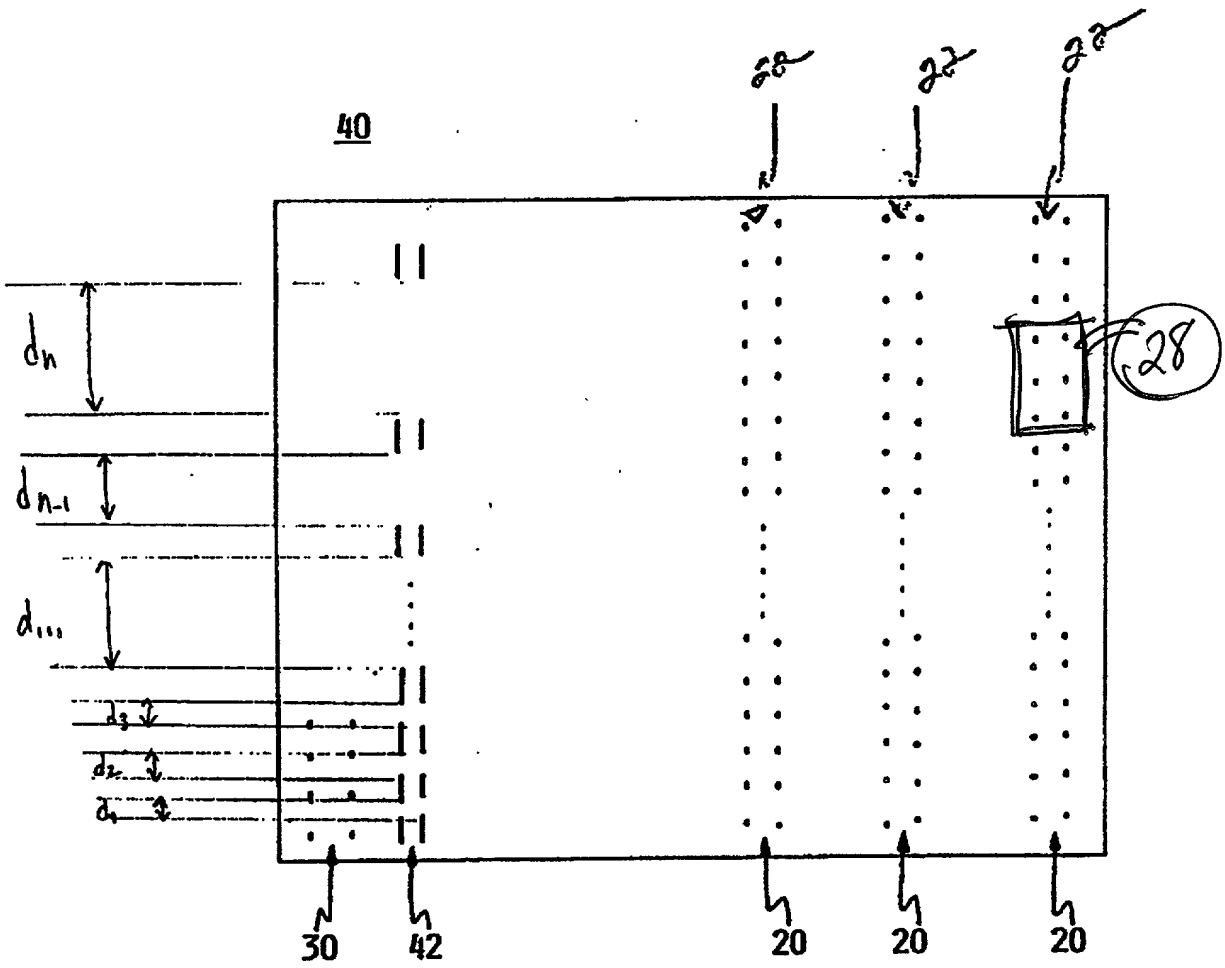

FIGURE 2

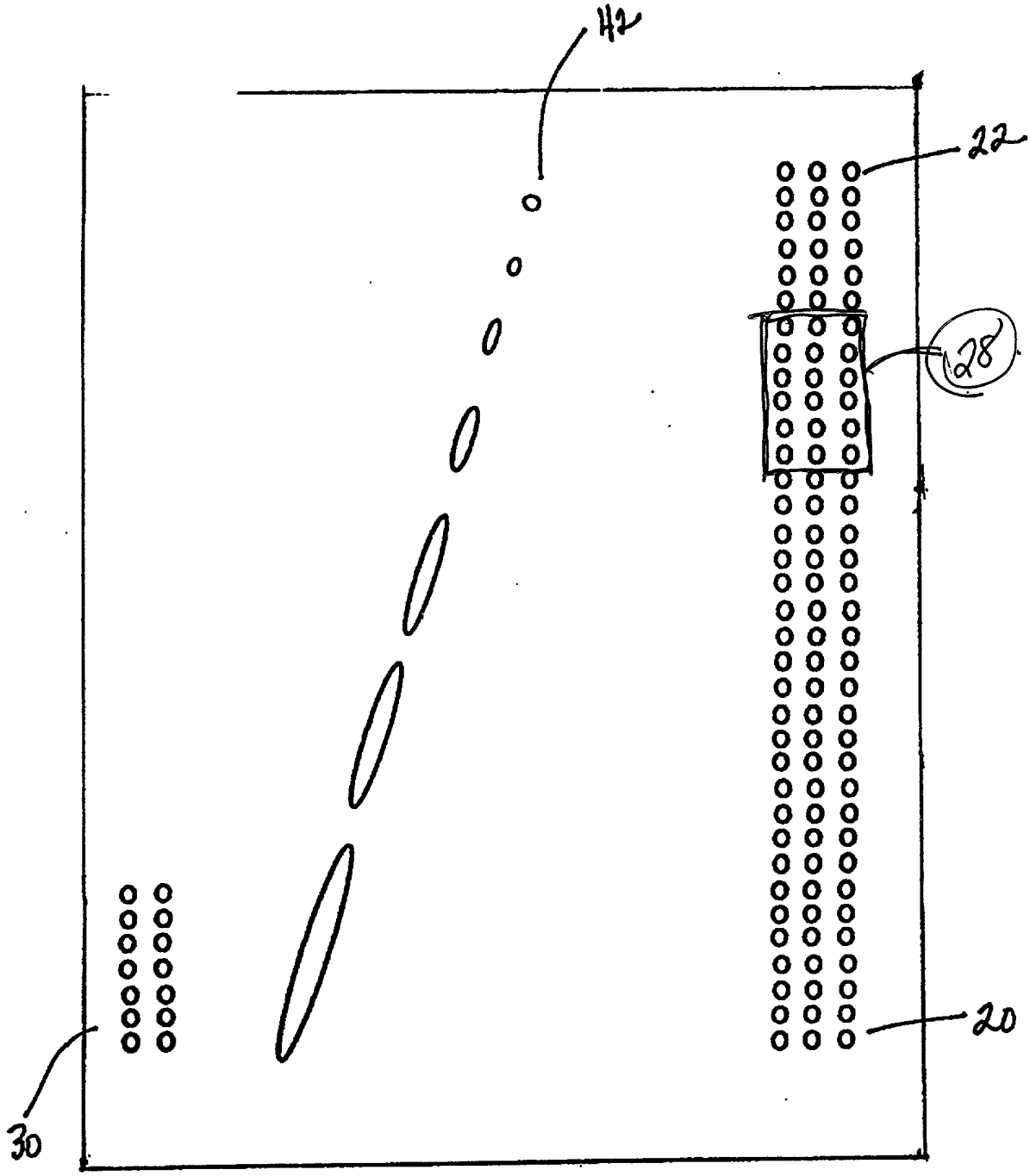

Figure 3

Sheet 3 of 4
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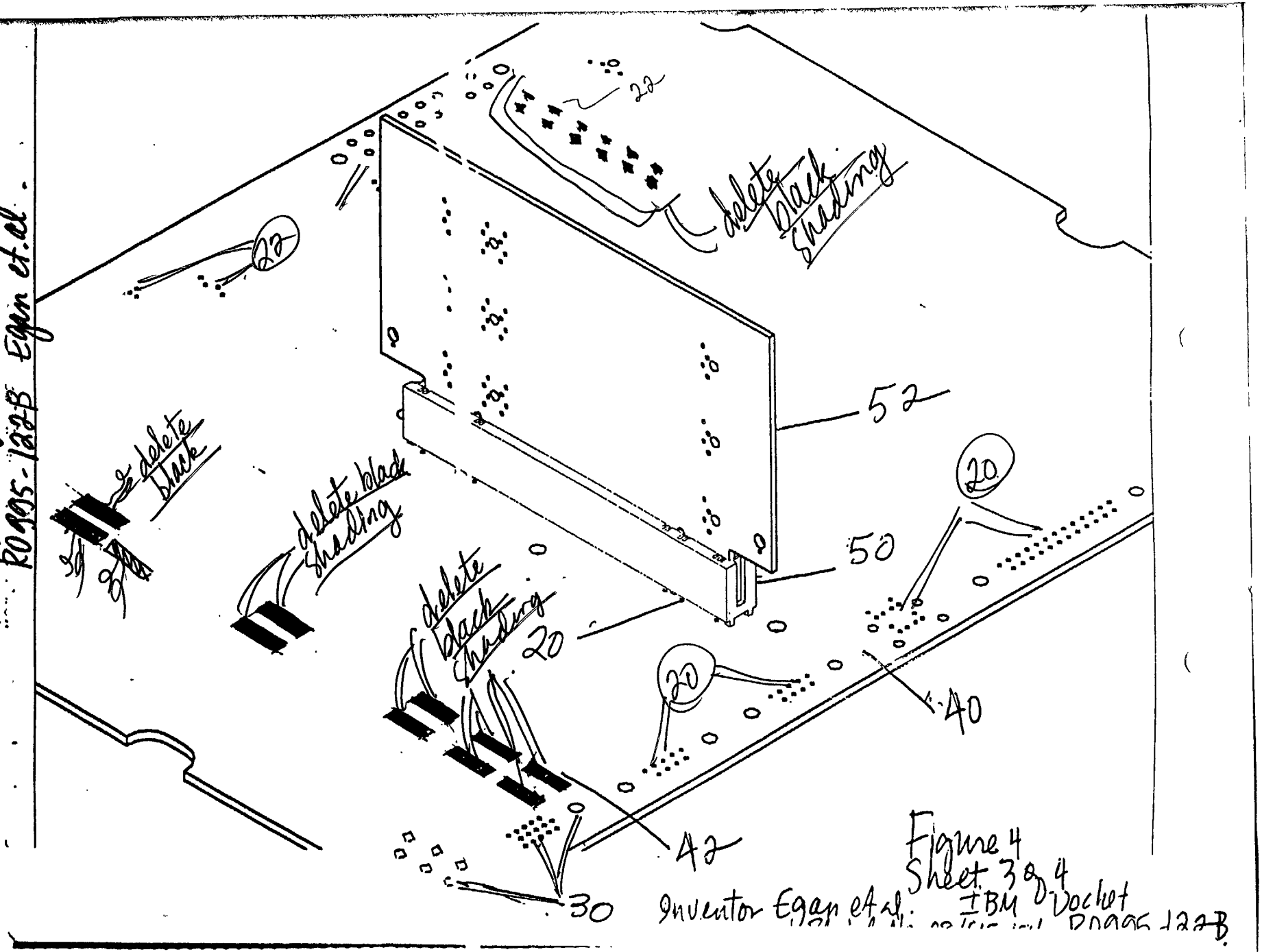

Figure 4
Sheet 3 of 4
Inventor Egan et al. IBM D. Docket RO995-122B

MERCHANT, GOULD, SMITH, EDELL, WELTER & SCHMIDT

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural ventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: ACKKPLANE POWER DISTRIBUTION SYSTEM

ıe specification of which
X is attached hereto
_ was filed on _____ as application serial no. _____ and was amended on __ (if applicable) (in the case of a PCT-filed ›plication) described and claimed in international no. __ filed __ and as amended on _ (if any), which I have reviewed and for which solicit a United States patent.

hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended y any amendment referred to above.

acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, ode of Federal Regulations, § 1.56 (see page 3 attached hereto).

hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or nventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a iling date before that of the application on the basis of which priority is claimed:

X no such applications have been filed.
). _ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) liste below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent nd Trademark Office connected herewith:

Adriano, Sarah B.	Reg. No. 34,470	Funk, Steven R.	Reg. No. 37,830	Nelson, Albin J.	Reg No. 28,650
Batzli, Brian H.	Reg. No. 32,960	Gabilan, Mary Susan	Reg. No. 38,729	Pauly, Daniel M.	Reg. No. P-40,123
Beard, John L.	Reg. No. 27,612	Gates, George H.	Reg. No. 33,500	Plunkett, Theodore	Reg. No. 37,209
Beck, Robert C.	Reg. No. 28,184	Golla, Charles E.	Reg. No. 26,896	Pollinger, Steven J.	Reg. No. 35,326
Bejin, Thomas E.	Reg. No. 37,089	Gorman, Alan G.	Reg. No. 38,472	Reich, John C.	Reg. No. 37,703
Berman, Charles	Reg. No. 29,249	Gould, John D.	Reg. No. 18,223	Reiland, Earl D.	Reg. No. 25,767
Bogucki, Raymond A.	Reg. No. 17,426	Gresens, John J.	Reg. No. 33,112	Schmaltz, David G.	Reg. No. P-39,828
Bruess, Steven C.	Reg. No. 34,130	Hamre, Curtis B.	Reg. No. 29,165	Schmidt, Cecil C.	Reg. No. 20,566
Byrne, Linda M.	Reg. No. 32,404	Hassing, Thomas A.	Reg. No. 36,159	Schuman, Mark D.	Reg. No. 31,197
Carlson, Alan G.	Reg. No. 25,959	Hillson, Randall A.	Reg. No. 31,838	Schumann, Michael D.	Reg. No. 30,422
Carter, Charles G.	Reg. No. 35,093	Hollingsworth, Mark A.	Reg No. 38,491	Sebald, Gregory A.	Reg. No. 33,280
Caspers, Philip P.	Reg. No. 33,227	Johnston, Scott W.	Reg. No. P-39,721	Sharp, Janice A.	Reg. No. 34,051
Chiapetta, James R.	Reg. No. P-39,634	Kastelic, Joseph M.	Reg. No. 37,160	Skoog, Mark T.	Reg. No. P-40,178
Clifford, John A.	Reg. No. 30,247	Kettelberger, Denise	Reg. No. 33,924	Smith, Jerome R.	Reg. No. 35,684
Conrad, Timothy R.	Reg. No. 30,164	Kowalchyk, Alan W.	Reg. No. 31,535	Sorensen, Andrew D.	Reg. No. 33,606
Cooper, Victor G.	Reg. No. P-39,641	Kowalchyk, Katherine M.	Reg. No. 36,848	Stinebruner, Scott A.	Reg. No. 38,323
Crawford, Robert	Reg. No. 32,122	Krull, Mark A.	Reg. No. 34,205	Strawbridge, Douglas A.	Reg. No. 28,376
Daignault, Ronald A.	Reg. No. 25,968	Lacy, Paul A.	Reg. No. P-38,946	Strodthoff, Kristine M.	Reg. No. 34,259
Daley, Dennis R.	Reg. No. 34,994	Lasky, Michael B.	Reg. No. 29,555	Sumner, John P.	Reg. No. 29,114
Daulton, Julie R.	Reg. No. 36,414	Lynch, David W.	Reg. No. 36,204	Sumners, John S.	Reg. No. 24,216
Davidson, Ben M.	Reg. No. 38,424	Mau, Michael L.	Reg. No. 30,087	Tellekson, David K.	Reg. No. 32,314
Dempster, Shawn B.	Reg. No. 34,321	McCormack, Myra H.	Reg. No. 36,602	Underhill, Albert L.	Reg. No. 27,403
DiPietro, Mark J.	Reg. No. 28,707	McDaniel, Karen D.	Reg. No. 37,674	Vandenburgn, J. Derek	Reg. No. 32,179
Dryja, Michael A.	Reg. No. P-39,662	McDonald, Daniel W.	Reg. No. 32,044	Welter, Paul A.	Reg. No. 20,890
Edell, Robert T.	Reg. No. 20,187	McDonald, Wendy M.	Reg. No. 32,427	Williams, Douglas J.	Reg. No. 27,054
Epp Ryan, Sandra	Reg. No. P-39,667	Miller, William D.	Reg. No. 37,988	Wood, Gregory B.	Reg. No. 28,133
Farber, Michael B.	Reg. No. 32,612	Mueller, Douglas P.	Reg. No. 30,300	Xu, Min S	Reg No. 39,536
Fauver, Cole M.	Reg. No. 36,797	Nasiedlak, Tyler L.	Reg. No. P-40,099	and;	
Garnett, Pryor A.	Reg. No. 32,136	Ellis, William T.	Reg. No. 26,874	Gamon, Owen J.	Reg. No. 36,243
Billion, Richard E.	Reg. No. 32,836	Bussan, Matthew J.	Reg. No. 33,614	Ojanen, Karuna	Reg. No. 32,484
Truelson, Roy W.	Reg. No. 34,265	Roth, Steven W.	Reg. No 34,712		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/ firm/organization/who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant, Gould to the contrary.

Please direct all correspondence in this case to Merchant, Gould, Smith, Edell, Welter & Schmidt at the address indicated below:

3100 Norwest Center, Minneapolis, MN 55402-4131

Telephone No. (612)332-5300

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor	Family Name Egan	First Given Name Patrick	Second Given Name Kevin
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Signature of Inventor 201	Signature of Inventor 202	
Date 3/6/96	Date 3/6/96	

For Additional Inventors:

_ Indicate here and attach sheet with same information, including date and signature.

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application;

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Docket No. RO995-122B

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

BACKPLANE POWER DISTRIBUTION SYSTEM

the specification of which (check one)

_X_ is attached hereto.

___ was filed on _____ was amended on _____.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
__(NONE)_____	_____	_____	___YES___NO
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under Title 35, United States Code, §120 of any United States Application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to the patentability of this applications as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No. 08/615,154, filed 12 March 1996, now U.S. Patent No. 5,841,074.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(List name and registration number)

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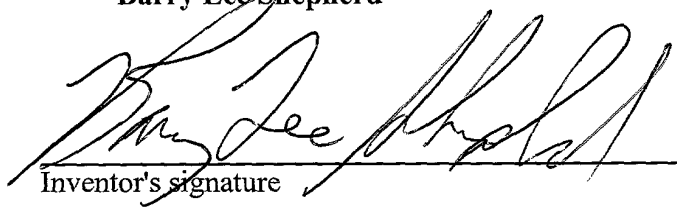

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_X_ This declaration ends with this page.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Patrick K. Egan et al.	:	Date: June 8, 2000
Group Art Unit:	2831	:	IBM Corporation
Examiner:	K. Cuneo	:	Intellectual Property Law
Serial No.:	09/074,213	:	Dept. 917, Bldg. 006-1
Filed:	May 7, 1998	:	3605 Highway 52 North
Title:	BACKPLANE POWER DISTRIBUTION SYSTEM	:	Rochester, Minnesota 55901

Assistant Commissioner for Patents
Washington, D. C. 20231

ASSOCIATE POWER OF ATTORNEY (37 CFR 1.34)
AND
CHANGE OF ATTORNEY'S ADDRESS IN APPLICATION

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EXPRESS MAIL CERTIFICATE

Express Mail Label No.: EK595507730US
Date: June 8, 2000

I hereby certify that I am depositing the enclosed or attached paper with the U.S. Postal Service "Express Mail Post Office to Addressee" service on the above date, addressed to the Assistant Commissioner for Patents, Box Patent Application, Washington, D.C. 20231.

James R Nock

James R. Nock

Respectfully Submitted

By Steven W. Roth

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